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Tolerances and Specifications

FOR

Commercial Weighing and Measuring Apparatus

FOR

State of California

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Prepared and Adopted by the
California State Department
of
Weights and Measures

SACRAMENTO, 1915

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TOLERANCES AND SPECIFICATIONS

PREPARED AND ADOPTED BY

STATE DEPARTMENT OF WEIGHTS AND MEASURES

CHAS. G. JOHNSON. Superintendent.

In the set of specifications promulgated herewith, a number of paragraphs have been limited to apply only to new apparatus in order that the Weights and Measures Act and the rules and regulations promulgated thereunder may be put into force and effect without unnecessary hardship and without wholesale condemnation of apparatus which, while not of the best construction, is nevertheless fairly satisfactory and may be used for some time without greatly prejudicing the rights of the purchasing public. The specifications taken as a whole are designed to improve the general types of apparatus and render possible the most efficient enforcement of the law. As old apparatus is replaced, only that of satisfactory construction will be allowed to be put into use; and at some future date, when the gradual process of elimination has been going on for some time, the limitations on the application of some of the specifications will be recalled and all apparatus in use will be required to be of satisfactory construction. The specifications which have been applied to both old and new apparatus are those which are most urgently required; the specifications which have been limited to affect new apparatus are those which, while clearly necessary, can best be postponed for general enforcement until the general provisions of the law and of the rules and regulations promulgated thereunder and of these specifications have been put into effect and have come to be understood, respected and observed throughout the State.

The object of all of these is not only for the benefit and the protection of the consumer, but for the benefit of the honest merchant and manufacturer as well, in assisting them to carry on their business free from the unjust competition of a dishonest and unscrupulous or an ignorant class.

APPLICATION OF SPECIFICATIONS.

These definitions, specifications, and tolerances are to be construed to apply to the usual types of weights and measures and weighing and measuring devices used in ordinary commercial transactions or usually coming within the jurisdiction of the weights and measures official, but only when a proper classification is herein provided for them. They shall also be construed to apply to apparatus used for special purposes whenever and in so far as they are clearly applicable, but not otherwise.

CLASSIFICATION OF SPECIFICATIONS.

The specifications on weights and measures and weighing and measuring devices shall be divided into two sets; the first to apply to all apparatus immediately upon adoption of the specifications; the second to be limited to apply only to new apparatus.

For the purpose of administration the following classes of apparatus are established:

Class 1. Weights and measures and weighing and measuring devices which, after the promulgation of these specifications, are manufactured in the State or brought into the State.

Class 2. Weights and measures and weighing and measuring devices which are in the State at the time of promulgation of these specifications, either in use, or in the stock of manufacturers of, or dealers in, such apparatus.

All the specifications shall apply to apparatus of Class 1.

Hereafter the specifications limited to apply to apparatus of Class 1 only, will be designated by a star (*) before the section affected.

LINEAR MEASURES.

SPECIFICATIONS.

1. Measures of length shall be made of a material, the form and dimensions of which remain reasonably permanent under normal conditions; for example, steel, brass, hard wood, etc.; provided, however, that tapes for commercial purposes may be made of cloth, but only when this is wire-woven and when by this means an actual and sufficient reinforcement and permanency is obtained.

*2. The ends of measures of length made of wood, or of other nonmetallic material liable to wear away through use, shall be protected by some metal not softer than brass, firmly attached to the measure.

3. Rigid measures of length shall be smooth and straight.

4. Folding measures of length shall be so constructed that each section will come to a definite stop, when straightened out.

5. Measures of length shall be graduated in units of the metric system or of the customary system and its usual subdivisions.

6. All graduations shall be clear and distinct and the main graduations shall be plainly designated. The length of these main graduations shall be greater than that of the intermediate graduations, and the latter shall be varied in length in such a way that they may be conveniently read.

*Applies to Class 1 apparatus only.

*7. Graduations shall not be greater in width than one-quarter of the width of the smallest subdivision; provided, however, that in no case shall the line be wider than .03 inch.

8. All graduations shall be uniformly spaced and be perpendicular to the edge of the measure.

9. Measures of length, so called, constructed by driving tacks into a counter, or in any similar way, shall not be subdivided.

TOLERANCES.

The tolerances to be allowed in excess or deficiency on all measures of length except tapes of steel or other metal shall not be greater than the following values:

Length	Tolerance
6 feet	3/16 inch
5 feet	5/32 inch
4 feet	1/8 inch
3 feet	3/32 inch
2 feet	1/16 inch
1 foot	1/32 inch
6 inches or less	1/64 inch

The tolerances to be allowed in excess or deficiency on all tapes of steel or other metal, shall not be greater than the following values:

Length	Tolerance	Tension
100 feet	1/4 inch	10 pounds
66 feet	3/16 inch	10 pounds
50 feet	1/8 inch	10 pounds
33 feet	3/32 inch	10 pounds
25 feet	1/16 inch	10 pounds
10 feet	1/16 inch	5 pounds
6 feet	1/32 inch	5 pounds
3 feet	1/32 inch	5 pounds

LIQUID CAPACITY MEASURES.

(NOT INCLUDING GRADUATED GLASSWARE.)

SPECIFICATIONS.

1. Liquid measures shall be made of metal, glass, earthenware, enameled ware, composition, or similar and suitable material, and shall be of sufficient strength and rigidity to withstand ordinary usage without becoming bent, indented, distorted or otherwise damaged.

2. Liquid measures of the customary systems shall be of one of the following capacities only: One gallon, a multiple of the gallon, or a

*Applies to Class 1 apparatus only.

binary sub-multiple of the gallon, that is, a measure obtained by dividing the gallon by the number 2, or by a power of the number 2; provided, however, that nothing in this specification shall be construed to prevent the use of forms for ice cream exclusively, in 5 pint and 3 pint sizes, or bottles for milk or cream in the 3 pint size.

3. Liquid measures shall be so constructed that the capacity is determined by a definite edge at the top of the measure.

4. No subdivided liquid measures shall be allowed, and the only reinforcing rings which may be used are those which are firmly attached to the outside of the measure, and do not, by indentations or in any other manner, show divisions or lines on the inside surface of the measure. Reinforcement rings shall be so placed that they will not be mistaken for graduations.

*5. The capacity of the measure shall be conspicuously, legibly and permanently indicated on the side of the measure. This shall be in combination with the word "Liquid" or the letters "Liq." in the case of measures in which the word "quart" or "pint" occurs. In the case of measures made of earthenware, enameled ware or composition, this marking shall be of a different color than the measure.

6. If a liquid measure is provided with a tap or spigot, the construction shall be such that the measure may be completely emptied by the tap or spigot while it is standing upon a level surface.

7. When a lip or rim, designed both to facilitate pouring and to receive any overflow, is provided, the measure must be so constructed as to hold its full capacity exclusive of the lip or rim, while it is standing upon a level surface.

TOLERANCES.

The tolerances to be allowed in excess and in deficiency on all liquid capacity measures shall not be greater than the following values:

Capacity	Tolerance			
	In excess		In deficiency	
10 gallons	10 fluid ounces	18 cubic inches	5 fluid ounces	9 cubic inches
5 gallons	6 fluid ounces	11 cubic inches	3 fluid ounces	5.4 cubic inches
4 gallons	4 fluid ounces	7 cubic inches	2 fluid ounces	3.6 cubic inches
3 gallons	4 fluid ounces	7 cubic inches	2 fluid ounces	3.6 cubic inches
2 gallons	2 fluid ounces	3.5 cubic inches	1 fluid ounce	1.8 cubic inches
1 gallon	1 fluid ounce	1.8 cubic inches	4 drams	.9 cubic inch
½ gallon	6 drams	1.4 cubic inches	3 drams	.7 cubic inch
1 quart	4 drams	.9 cubic inch	2 drams	.5 cubic inch
1 pint	3 drams	.7 cubic inch	1.5 drams	.3 cubic inch
½ pint	2 drams	.4 cubic inch	1 dram	.2 cubic inch
1 gill	2 drams	.4 cubic inch	1 dram	.2 cubic inch

*Applies to Class 1 apparatus only.

MEASURING PUMPS.

SPECIFICATIONS.

1. When a measuring pump is provided with adjustable stops, the construction shall be such that each stop can be separately sealed in such a manner that its position cannot be changed without destroying the seal.

2. When a measuring device is provided with a graduated or notched scale intended to indicate the amount to be delivered, this scale shall be riveted or otherwise permanently fixed in position.

3. The amounts delivered shall not vary by more than the tolerance allowed, irrespective of the speed with which the pump is operated and of the time elapsing between operations.

TOLERANCES.

The tolerances to be allowed in excess and in deficiency shall not be greater than the values given for the liquid measure of corresponding capacity and kind, in the preceding tolerance table for liquid measures.

MILK BOTTLES.

SPECIFICATIONS.

1. Bottles used for the sale of milk or cream shall be made only in sizes heretofore specified under the heading "Liquid Capacity Measures."

*2. Each bottle shall have its capacity clearly blown or otherwise clearly and permanently marked in or on the side of the bottle, and in or on the side or bottom the name, initials or trade-mark of the manufacturer thereof.

3. Glass bottles with an inside diameter of not over two inches immediately below the cap seat or stopple shall hold the correct capacity when filled within $\frac{1}{8}$ inch of this cap seat or stopple; bottles with an inside diameter of over this amount immediately below the cap seat or stopple shall hold the correct capacity when filled to within $\frac{1}{8}$ inch of this cap seat or stopple. Provided, however, that when bottles are used for the purpose of pasteurizing milk or cream in the bottle, a larger distance shall be allowed below the cap seat or stopple but not to exceed that given in the table below. Such bottles shall be provided with a clearly defined line blown or otherwise clearly and permanently marked in or on the bottle, and extending at least one-half way around it, which indicates the correct capacity. The words "For milk pasteurized in the

*Applies to Class 1 apparatus only.

bottle only" or a similar wording shall be clearly blown or otherwise clearly and permanently marked in or on the side of the bottle; and directly over, below or beside the line mentioned above, the words, "Fill to this line." Such bottles shall be used only when the milk or cream is pasteurized in the bottle.

TOLERANCES.

The tolerances to be allowed in excess or deficiency on individual bottles, and on the average content of bottles, shall not be greater than the following values. The error on the average content of bottles shall be determined by finding the error on each of not less than 25 bottles selected at random from at least four times the number tested, and taking the average of these errors.

Capacity	Tolerance on individual bottle		Tolerance on average content	
½ gallon	6 drams	1.4 cubic inches	2.0 drams	.5 cubic inch
3 pints	5 drams	1.2 cubic inches	1.75 drams	.43 cubic inch
1 quart	4 drams	.9 cubic inch	1.5 drams	.34 cubic inch
1 pint	3 drams	.7 cubic inch	1.25 drams	.29 cubic inch
½ pint	2 drams	.5 cubic inch	1.25 drams	.29 cubic inch
1 gill	2 drams	.5 cubic inch	1.25 drams	.29 cubic inch

BERRY BASKETS OR BOXES.

SPECIFICATIONS.

1. Baskets or boxes for berries or small fruits, of a capacity of one dry quart or less, shall be of one of the following sizes: One quart, one pint, or one-half pint, dry measure.

2. Berry boxes shall not have a false bottom. That is, having the bottoms set part way up into the box.

TOLERANCES.

The tolerances to be allowed in excess or deficiency, on baskets or boxes for berries or small fruits, constructed of wood, shall not be greater than the following values:

Capacity		Tolerance	
Dry measure	Cubic contents	In excess	In deficiency
1 quart	67.2 cubic inches	3 cubic inches	1½ cubic inches
1 pint	33.6 cubic inches	2 cubic inches	1 cubic inch
½ pint	16.8 cubic inches	1 cubic inch	½ cubic inch

The tolerances to be allowed in excess or deficiency, on baskets or boxes for berries or small fruits, constructed of pasteboard or fibre, shall not be greater than the following values:

Capacity		Tolerance	
Dry measure	Cubic contents	In excess	In deficiency
1 quart	67.2 cubic inches	2 cubic inches	1 cubic inch
1 pint	33.6 cubic inches	1 cubic inch	½ cubic inch
½ pint	16.8 cubic inches	½ cubic inch	¼ cubic inch

Series No. 13. May 7, 1915.

OPINION ON BERRY AND FRUIT BASKETS.

To all city and county sealers of weights and measures:

This department has had under consideration the application of the "Net Container Act" (Chap. 167, Statutes 1913), requiring the marking of the quantity of contents upon food in package form, to berries, in small open containers, and when packed in crates.

It is the opinion of this department that berries, peaches, apricots, plums, or other fruits, or tomatoes, placed in small open boxes or baskets, which are arranged in layers or tiers and packed in crates, constitute food in package form, within the meaning of the "Net Container Act" and that consequently the law requires that such baskets or boxes and crates shall be marked with a statement of the minimum quantity of contents, in accordance with the provisions of the "Net Container Act."

This opinion shall not become effective and in force until January, 1916; provided, however, that its provisions shall not conflict with the provisions of any city or county ordinance now in force.

Very truly yours,

CHAS. G. JOHNSON,
State Superintendent of Weights and Measures.

SCALES.

GENERAL SPECIFICATIONS.

1. The nominal or rated capacity of a scale is the largest weight indication which can be obtained by the use of all its reading or recording elements in combination.

When one reading or recording element of the scale is designed for auxiliary use only, such as a small bar and poise intended for use in determining weights intermediate between two graduations on the principal bar of the beam, the weight value of this reading or recording element need not be included in the sum, provided that it does not exceed one per cent of the sum of the weight values of the remaining

reading or recording elements. (Thus, a platform scale with the principal bar of the beam graduated to 100,000 pounds by 1,000 pound subdivisions and with an auxiliary bar graduated to 1,000 pounds by 20 pound subdivisions, may be considered as having a nominal capacity of 100,000 pounds.)

When a scale is designed for use with removable weights and these are furnished with the scale, the amount which these represent when used on the scale shall be included in the sum of the weight values of the reading elements. When the scale is designed for use with removable weights, but these are not furnished with the scale, the amount which those represent on the scale that are usually furnished with the scale when weights are included, shall be included in the sum of the weight values of the reading elements.

*2. All scales not equipped with a beam or reading face graduated to the full capacity of the scale, or those not equipped with a graduated beam or reading face, which, taken in connection with another graduated beam or beams or with a graduated runner, indicates the capacity of the scale, shall have the nominal capacity conspicuously, clearly, and permanently marked upon them.

3. All scales shall be of such construction that they will support a load of maximum capacity without undue bending or straining of the parts.

4. All knife-edges shall be firmly secured to the levers.

*5. All knife-edges shall be of hardened and tempered steel. They shall be sharp and bear throughout the entire length of the parts designed to be in contact.

*6. All bearings shall be smooth and at least as hard as the knife-edges. For scales of more than 5,000 pounds capacity, the bearings shall be made of hardened and tempered steel. (The term "bearing" used in this paragraph refers to the entire surface which is designed to be in contact with the edge of a knife-edge or with a point bearing.)

*7. Plates or caps used to limit the longitudinal motion of a knife-edge shall be smooth and be made of a material at least as hard as the knife-edge. The part of the knife-edge liable to come in contact with these plates or caps shall be so formed that the friction between them is reduced to a minimum.

*8. If a scale has a nose-iron, the position of this at the time of installation of the scale shall be clearly and accurately indicated.

9. If the scale has interchangeable or reversible parts, these shall be so constructed that their change or reversal shall not affect the balance or the accuracy of the instrument.

*10. No scale shall be equipped with a scoop counter-balanced by a removable poise or weight.

*Applies to Class 1 apparatus only.

11. When the scale is equipped with a permanently attached device intended to counter-balance the weight of a removable scoop, this device shall clearly indicate on the customers' side of the scale, whether the scoop should be on or off the scale.

12. The graduations on all beams shall consist of lines, or notches, or of a combination of these. All lines shall be uniform in spacing and parallel to each other. All notches shall be evenly cut and the lines formed by the intersection of the sloping planes of their sides must be uniform in spacing and parallel to each other.

13. Each main weight graduation on a beam shall be so marked as to indicate the weight represented by the poise at that point.

14. Shoulders or stops shall be provided on all beams to prevent the poise traveling and remaining back of the zero graduation.

15. The adjusting material in all poises shall be securely enclosed and firmly fixed in position. If of lead or other material softer than brass, it shall not be in contact with the beam.

16. Poises shall be so constructed that no part can be easily detached, and if equipped with a set screw, this shall not be removable.

17. Poises on notched beams shall be provided with a pawl or other device, so constructed as to cause the poises to be seated into a definite and correct position in each notch, wherever in the notch the pawl or other device is placed, and to be held there firmly and without appreciable movement.

18. The bearing edge of a hanging poise shall be hard and shall be so formed as to seat in a definite and correct position in each notch on the beam.

19. Reading edges or indicators of poises shall be sharply defined, and all reading edges shall be parallel to the graduations on the beam.

*20. Poises shall not be readily detachable from the beam.

21. When scales are equipped with a beam, the position or oscillation of which is used to indicate the balance of the scale, the normal position of this beam shall be horizontal and it shall have equal play above and below the normal horizontal position.

22. No scale shall be equipped with an unstable or accelerating beam.

*23. Scale pans in which fish or other wet commodities are placed when weighed shall be so constructed as to provide for drainage.

24. All scales shall be of such construction that they are reasonably permanent in their adjustment and will repeat their weight indications correctly, and are not designed to, or may not be used to facilitate the perpetration of fraud.

25. All scales shall be maintained in balance.

A scale is in balance, as the term is used herein, when it correctly gives a weight indication of zero, when there is no load on the platform, plate, pan, or scoop.

*Applies to Class 1 apparatus only.

A lever scale of the non-automatic type not having an indicator and a graduated scale or arc, is in balance when the beam comes to rest at, or oscillates through approximately equal arcs above and below the center of the trig-loop when one is provided; or a position midway between other stops when these are provided; or a horizontal position when no trig-loop or other stops are provided.

A scale of the non-automatic type having an indicator and a graduated scale or arc, is in balance when the indicator comes to rest at, or oscillates through approximately equal arcs about, a definite and clear zero graduation.

A scale of the automatic type, that is, one having a reading face or dial, is in balance when the indicator comes to rest at a definite and clear zero graduation.

SENSIBILITY RECIPROCAL.

The term "sensibility reciprocal" hereinafter referred to is defined as the weight required to move the position of equilibrium of the beam, pan, pointer, or other indicating device of a scale a definite amount, the effect of friction in causing inconstancy of this position of equilibrium being eliminated.

In scales provided with a beam and trig-loop, the sensibility reciprocal is the weight required to be placed upon the platform to turn the beam from a horizontal position of equilibrium in the middle of the trig-loop to a position of equilibrium at the top of the loop, the effect of friction being eliminated as above. The sensibility reciprocal may be determined by subtracting the weight instead of adding it, thereby causing the beam to assume a position of equilibrium at the bottom of the loop; or indirectly, by moving the sliding poise on the beam the required amount in either direction, to obtain the specified change in the position of equilibrium of the beam; or by adding or subtracting small weights to or from the counterpoise until the specified change is obtained, and determining the equivalent of the small weights used, in terms of weight on the platform.

In the case of scales with stabilized pans or plates such as equal-arm trip scales and scales with a single pan or plate above the beam, and also scales with a pan or pans hanging from the beam, which are not provided with a pointer moving over a graduated arc or scale, the sensibility reciprocal is the amount of weight required on the pan or plate to cause it to move from its position of equilibrium, when the scale is in balance, to a position of equilibrium, at the limit of its motion.

In the case of scales provided with a pointer, and a graduated scale or arc, over which the pointer vibrates as a convenient means of determining the position of equilibrium, and which does not, of itself,

directly indicate in terms of weight, the sensibility reciprocal is the weight required to cause a change in the position of rest of the pointer equal to one division on the graduated scale or arc. (Examples of these scales are the usual cream test or butter-fat test scale and some forms of the apothecaries' prescription scale.)

The sensibility reciprocal does not apply to reading faces or dials which indicate directly in terms of weight. But no such reading face or dial which is purely auxiliary to the scale mechanism, such as one, for instance, which may or may not be employed in the determination of weight, shall be construed to exempt a scale from the "sensibility reciprocal" requirement, when this is detached.

PLATFORM SCALES.

SPECIFICATIONS.

1. The foundations of all built-in scales shall be firm and substantial.

2. Platform scales having an outside frame shall be equipped with means for centering and checking. These shall cause the platform bearings to return to their normal line of contact on the knife-edges when the platform is displaced to the full extent allowed and also shall prevent the platform bearings from such a displacement that the centering will not take place. The above results may be obtained by any proper means that will not introduce excessive friction and will not cause binding, when the parts have been so caused to return to their normal weighing positions.

3. Platform scales shall be so constructed that there is sufficient clearance between the platform and the frame to allow for any expansion due to weather effects. Sufficient clearance shall also be provided to prevent the live parts of the scale from binding on account of an ordinary accumulation of dirt or other ordinary causes.

*4. A wagon scale should have at least 12 feet of straight way on either side of the scale in the same plane as the platform.

5. Platforms and levers shall be of sufficiently rigid construction that the degree of deflection under the maximum load will not endanger the accuracy of the scale.

6. If a scale is equipped with a relieving device, this shall be so constructed that, when the beam is balanced and the device is used to relieve it and engage it again, one or more times, the former balance will again be assumed by the beam.

NOTE.—The effect of friction on a scale is to make possible a variation of the load on the pan, plate or platform without any corresponding change in the indication. The value of the sensibility reciprocal which is determined with the effect of friction present will, therefore, be in error by a variable amount. However, in making tests this error must be neglected.

*Applies to Class 1 apparatus only.

*7. When corner platform loops are removable, each shall be so marked or shaped as to identify it with its proper corner.

*8. All devices for adjusting the balance of a counter platform scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the movable mechanism of the scale itself; such as a screw driver, wrench, etc., but not an adjusting pin.

*9. All devices for adjusting the level of a counter platform scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the leveling devices; such as a screw driver, wrench, etc., but not an adjusting pin.

10. All platform scales, except track scales, shall be so constructed that when a load consisting of test weights, representing more than one-quarter of the capacity of the scale and not exceeding such capacity, is placed so that its center of gravity lies over the points designated by circles in Diagram No. 1, the error at each point shall not exceed the tolerance allowed in the following table for the load employed. If a load equal to or less than one-quarter of the capacity is used, this shall be placed so that its center of gravity lies directly over the platform bearings designated by the circles in Diagram No. 2, and the errors shall not exceed those indicated above.

*11. Any device for altering the sensibility of the scale shall be so limited in its adjustment that the beam cannot be made unstable by the manipulation of the device.

12. The minimum travel of the beam in the trig-loop shall conform to the following table:

Length of beam	Minimum travel of beam in trig-loop
Under 12 inches	.4 inch
Over 12 inches, including 20 inches	.5 inch
Over 20 inches, including 40 inches	.7 inch
Over 40 inches and up	.9 inch

(The "length of beam" refers to the distance from the fulcrum to the trig-loop.)

13. All weighing beams shall be so marked and graduated and all poises on these beams shall be so constructed that the weight corresponding to any position of the poise can be read directly on the beam. This condition shall be fulfilled whether a registering or stamping device is used or not.

*Applies to Class 1 apparatus only.

SENSIBILITY RECIPROCAL.

The maximum sensibility reciprocal allowable on all platform scales, except counter platform scales, shall not exceed the value of two of the minimum graduations on the beam, at the capacity of the scale or at any lesser load. Provided, however, that the manufacturers' maximum sensibility reciprocal or the maximum sensibility reciprocal on all new platform scales, except counter platform scales, shall not exceed the value of one of the minimum graduations on the beam at the capacity or at any lesser load. The maximum sensibility reciprocals for counter platform scales are given hereafter under the heading "Counter Balances and Scales."

(The term "sensibility reciprocal" means the weight required to move the position of equilibrium of the beam, pan, pointer or other indicating device of a scale a definite amount. In scales provided with a beam and trig-loop the sensibility reciprocal is the weight required to be placed upon the platform to turn the beam from a horizontal position of equilibrium in the middle of the trig-loop to a position of equilibrium at the top of the loop. The sensibility reciprocal may be determined by subtracting the weight instead of adding it, thereby causing the beam to assume a position of equilibrium at the bottom of the loop; or indirectly, by moving the sliding poise on the beam the required amount in either direction, to obtain the specified change in the position of equilibrium of the beam; or by adding or subtracting small weights to or from the counter-poise until the specified change is obtained, and determining the equivalent of the small weights used, in terms of weight on the platforms.)

EXPLANATION OF FOLLOWING TABLE.

"Class A" scales include the following: scales of the portable platform type; and also scales of the dormant type which are installed inside of a building having side walls and roof, which protect the scale from weather effects and from sudden changes of temperature.

"Class B" scales include the following: scales of the railroad track and wagon types; and also scales of the dormant type which are not installed inside of a building having side walls and roof, and which are exposed to weather effects and sudden changes of temperature.

The columns with the heading "Tolerance on Ratio" refer to the error in the ratio or multiplying power of scales with which counterpoise weights are used.

NOTE.—The latter effect, since it causes the condensation of moisture on the scale parts, often has as serious results on the condition of the scale, as have weather effects.

The columns with the heading "Tolerance on Beam" refer to those parts of scales not requiring the use of removable weights; for example, a beam.

The column with the heading "Load" refers to the amount of weight on the platform of the scale.

In the case of railroad track scales, designed and used for weighing ordinary freight traffic, when the test load consists of a one truck test car, the largest algebraic mean of any two errors found for different positions of the test truck, shall not exceed the tolerance corresponding to the test load used. Provided, however, that on the same span the positions of the test car shall be restricted to the opposite ends of that span. The tolerance given in the table is not to be applied to the error found for a single position of the test load.

The largest algebraic mean of any two errors may be defined as one-half of the largest, plus (+) or minus (—), sum that can be obtained by adding any two errors, such as two plus (+) errors, two minus (—) errors, a numerically large plus (+) error and a numerically small minus (—) error, or a numerically large minus (—) error and a numerically small plus (+) error.

In order that the largest algebraic mean of any two errors, which represents the maximum error of freight car weighing, may not differ appreciably from the true amount, a test car having a wheel base not exceeding seven feet should be used.

TOLERANCES.

The tolerances to be allowed in excess or deficiency on all platform scales, except counter platform scales, shall not be greater than the following values. Provided, however, that the manufacturers' tolerances or the tolerances on all new platform scales, except counter platform scales, shall not be greater than one-half of the values given; and provided, further, that these tolerances on all these platform scales, shall in no case be less than the value of one of the minimum graduations on the beam except that the manufacturers' tolerances or the tolerances on new apparatus shall in no case be less than the value of one-half of one of the minimum graduations on the beam. The tolerances for counter platform scales are given hereafter under the heading "Counter Balances and Scales."

Load	Inside scales—Tolerance		Outside scales—Tolerance	
	On multiplication ratio	On beam	On multiplication ratio	On beam
50 pounds	½ ounce	1 ounce		
100 pounds	1 ounce	2 ounces		
200 pounds	2 ounces	4 ounces		
240 pounds	3 ounces	6 ounces		
300 pounds	3 ounces	6 ounces		
400 pounds	4 ounces	8 ounces		
500 pounds	5 ounces	10 ounces	10 ounces	1¼ pounds
600 pounds	6 ounces	12 ounces	12 ounces	1½ pounds
800 pounds	8 ounces	1 pound	1 pound	2 pounds
1,000 pounds	8 ounces	1 pound	1 pound	2 pounds
1,200 pounds	10 ounces	1¼ pounds	1¼ pounds	2½ pounds
1,500 pounds	12 ounces	1½ pounds	1½ pounds	3 pounds
1,800 pounds	14 ounces	1¾ pounds	1¾ pounds	3½ pounds
1 ton	1 pound	2 pounds	2 pounds	4 pounds
1½ tons	1¼ pounds	2½ pounds	2½ pounds	5 pounds
2 tons	2 pounds	4 pounds	4 pounds	8 pounds
3 tons	3 pounds	6 pounds	6 pounds	12 pounds
4 tons	4 pounds	8 pounds	8 pounds	16 pounds
5 tons	5 pounds	10 pounds	10 pounds	20 pounds
6 tons	6 pounds	12 pounds	12 pounds	24 pounds
8 tons	8 pounds	16 pounds	16 pounds	32 pounds
10 tons	10 pounds	20 pounds	20 pounds	40 pounds
12 tons	12 pounds	24 pounds	24 pounds	48 pounds
15 tons	15 pounds	30 pounds	30 pounds	60 pounds
20 tons	20 pounds	40 pounds	40 pounds	80 pounds
40 tons	40 pounds	80 pounds	80 pounds	160 pounds
50 tons	50 pounds	100 pounds	100 pounds	200 pounds
80 tons	80 pounds	160 pounds	160 pounds	320 pounds
100 tons	100 pounds	200 pounds	200 pounds	400 pounds
150 tons	150 pounds	300 pounds	300 pounds	600 pounds
200 tons	200 pounds	400 pounds	400 pounds	800 pounds

COUNTER BALANCES AND SCALES.

SPECIFICATIONS.

1. Bearings shall be so shaped that when the beam is displaced in any manner, the knife-edges will return to their proper line of contact. (The term "bearing" as used in this specification is defined as that part of the scale designed to be in contact with the edge of the knife-edge.)

2. All loose material used for adjusting the balance of a scale shall be securely enclosed.

3. All devices for adjusting the balance of a counter scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the movable mechanism of the scale itself, such as a screw driver, wrench, etc., but not an adjusting pin.

4. All devices for adjusting the level of a counter scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the leveling devices; such as a screw driver, wrench, etc., but not an adjusting pin.

*5. Counter scales whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 3 degrees or approximately 5 per cent with the horizontal, shall be equipped with a device which will indicate when the scale is level, and in no case shall any pendulum operating the scale be considered a leveling device. The scale shall be rebalanced at zero each time its position is altered during this test.

*6. In the case of equal arm scales, either with stabilized pans or plates, that is, those above the beam, or with suspended pans or plates, the minimum fall or drop of the pans or plates from their highest point shall be as follows:

Capacity	Minimum fall
4 pounds and below	.35 inch
From 4 pounds including 12 pounds	.5 inch
From 12 pounds including 26 pounds	.75 inch
Over 26 pounds	1.0 inch

7. In the case of counter scales having unequal arms or a compound lever system and having a graduated beam which is not provided at or near its end with a trig-loop or graduated scale or arc or other suitable reference interval or point for establishing the proper position of

*Applies to Class 1 apparatus only.

balance of the beam, the beam shall have a minimum total angular play of 8 per cent or approximately 5 degrees. In the case of such scales which are provided with a trig-loop or graduated scale or arc or other suitable reference interval or point, the minimum total movement of the beam at such point shall be 0.4 inch if the beam is 12 inches or less in length and 0.5 inch if the beam is over 12 inches in length. (The angular motion of the beam in terms of per cent may be obtained by dividing the total fall or drop of the beam at its end by the distance from the fulcrum to the end of the beam, and multiplying this quotient by 100.)

*8. Scales of such construction that any weight or weights which are not visible can be added so as to affect the indications of the scale, shall be equipped with a device which will plainly indicate on the customers' side of the scale when the weight or weights have been added and the value which it or they represent on the scale.

9. On scales of the equal-arm type with stabilized pans, that is, pans above the beam, the under connections and a line connecting the outer knife-edges in the beam, shall form a parallelogram. These under connections shall be straight and work freely.

10. All scales shall be so constructed that when a weight whose body has approximately equal diameter and height and which represents one-half of the capacity of the scale, is shifted in any direction on the weight plate or on the commodity plate, pan or scoop, to a point one-half the distance between the center and edge of the weight plate or the commodity plate, pan or scoop, the additional resulting error in the weight indication, due to this cause alone, shall not exceed the tolerance allowed on a part of a scale requiring the employment of removable weights, at the load in question; provided, however, that in this test, the edge of the weight shall not be made to project over the edge of the weight plate or the commodity plate, pan or scoop.

11. In the case of counter scales equipped with an indicator and a reading face or dial, such parts shall conform to all the specifications applicable to them, given under the heading "Spring Scales," except that the graduations are not required to be equally spaced.

12. All counter scales shall be in level.

SENSIBILITY RECIPROCAL.

The maximum sensibility reciprocal allowable for counter scales shall not exceed the values given in the table below, with the exception, that when the maximum sensibility reciprocal herein given is a larger value than that represented by two of the minimum graduations on any beam with which the scale may be equipped, the latter value shall be applied and used as the maximum sensibility reciprocal. Provided, however,

*Applies to Class 1 apparatus only.

that the manufacturers' maximum sensibility reciprocals or the maximum sensibility reciprocals on all new counter scales shall be one-half of the values given in the table unless this value is greater than one of the minimum graduations on the beam, in which case this latter value shall be used.

(The term "sensibility reciprocal" means the weight required to move the position of equilibrium of the beam, pan, pointer or other indicating device of a scale a definite amount. In the case of scales with stabilized pans or plates, such an equal-arm trip scale and scales with a single pan or plate above the beam, and also scales with a pan or pans hanging from the beam which are not provided with a pointer moving over a graduated arc or scale, the sensibility reciprocal is the amount of weight required on the pan or plate to cause it to move from its position of equilibrium, when the scale is in balance, to a position of equilibrium at the limit of its motion.)

Sensibility reciprocals		Sensibility reciprocals	
Capacity	Sensibility reciprocals	Capacity	Sensibility reciprocals
1 pound	$\frac{1}{8}$ ounce	40 pounds	$1\frac{1}{4}$ ounces
2 pounds	$\frac{1}{8}$ ounce	50 pounds	$1\frac{1}{2}$ ounces
4 pounds	$\frac{1}{4}$ ounce	60 pounds	$1\frac{1}{2}$ ounces
5 pounds	$\frac{1}{4}$ ounce	75 pounds	2 ounces
6 pounds	$\frac{1}{4}$ ounce	90 pounds	$2\frac{1}{2}$ ounces
8 pounds	$\frac{1}{2}$ ounce	100 pounds	3 ounces
10 pounds	$\frac{1}{2}$ ounce	150 pounds	$4\frac{1}{2}$ ounces
12 pounds	$\frac{1}{2}$ ounce	200 pounds	6 ounces
15 pounds	$\frac{3}{4}$ ounce	240 pounds	$7\frac{1}{2}$ ounces
20 pounds	$\frac{3}{4}$ ounce	250 pounds	$7\frac{1}{2}$ (8) ounces
24 pounds	1 ounce	300 pounds	9 ounces
25 pounds	1 ounce	350 pounds	$10\frac{1}{2}$ ounces
30 pounds	1 ounce	400 pounds	12 ounces

TOLERANCES.

Except on the special tests described above, the tolerances to be allowed in excess or deficiency on counter scales shall not be greater than the following values. Provided, however, that the manufacturers' tolerances or the tolerances to be allowed on new counter scales, shall not be greater than one-half of the values given; and provided, further, that the tolerances on counter scales shall in no case be less than one-fourth of the sensibility reciprocal of the scale; and when the scale has a reading face or dial, the tolerance shall in no case be less than one-fourth of the minimum graduation on the reading face or dial, except that on new scales they shall in no case be less than one-eighth of such minimum graduation.

Load	Tolerance	
	Tolerance on parts requiring employment of weights	Tolerance on beam or reading face
1 pound	1/16 ounce	1/16 ounce
2 pounds	1/16 ounce	1/8 ounce
4 pounds	1/8 ounce	3/16 ounce
5 pounds	1/8 ounce	3/16 ounce
6 pounds	1/8 ounce	3/16 ounce
8 pounds	1/4 ounce	3/8 ounce
10 pounds	1/4 ounce	3/8 ounce
12 pounds	1/4 ounce	3/8 ounce
15 pounds	5/16 ounce	1/2 ounce
16 pounds	5/16 ounce	1/2 ounce
20 pounds	5/16 ounce	1/2 ounce
24 pounds	3/8 ounce	1/2 ounce
25 pounds	3/8 ounce	1/2 ounce
30 pounds	3/8 ounce	5/8 ounce
40 pounds	7/16 ounce	5/8 ounce
50 pounds	1/2 ounce	3/4 ounce
60 pounds	5/8 ounce	1 ounce
75 pounds	3/4 ounce	1 ounce
90 pounds	7/8 ounce	1 1/4 ounces
100 pounds	1 ounce	1 1/2 ounces
150 pounds	1 1/2 ounces	2 ounces
200 pounds	2 ounces	3 ounces
240 pounds	2 1/2 ounces	4 ounces
250 pounds	2 1/2 ounces	4 ounces
300 pounds	3 ounces	4 1/2 ounces
350 pounds	3 1/2 ounces	5 ounces
400 pounds	4 ounces	6 ounces

SPRING BALANCES.

SPECIFICATIONS.

1. Graduated faces shall be permanently fixed in position.

2. All graduations shall be clear and distinct and equally spaced.

*3. The clear interval between the graduations shall not be less than .04 inch.

4. The maximum value of the graduations on spring balances used in the sale of foodstuffs at retail shall be 1 ounce; provided, however, that this shall not apply to scales used exclusively in the sale of vegetables.

5. The scale shall have a definite and clear zero graduation and there shall be no stop to prevent the indicator from going beyond the zero graduation. These conditions shall be fulfilled whether the entire face is graduated or the graduations commence at a fixed load.

6. The indicator shall be firmly attached and reach to the graduated divisions.

*7. That part of the indicator which reaches to the smallest subdivisions shall not exceed the width of these subdivisions.

*Applies to Class 1 apparatus only.

8. The distance between the indicator and the reading face shall not exceed .12 inch.

*9. All devices for adjusting the balance of a spring scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the movable mechanism of the scale itself; such as a screw driver, wrench, etc., but not an adjusting pin.

*10. All devices for adjusting the level of a spring scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the leveling devices; such as a screw driver, wrench, etc., but not an adjusting pin.

11. No device to alter the working or effective length of the spring shall be placed on the outside of the scale.

12. Spring balances of the hanging type shall be freely suspended from the ring when in use.

13. If scales are provided with a hanging pan, this shall be suspended from a ring and no hook will be allowed. A hook may be used only on those scales for which no pan is provided.

14. All scales shall be so constructed that when a weight whose body has approximately equal diameter and height and which represents one-half of the capacity of the scale, is shifted in any direction on the commodity plate, pan or scoop, to a point one-half the distance between the center and the edge of the plate, pan or scoop, the additional resulting error in the weight indication, due to this cause alone, shall not exceed the tolerance allowed at the load in question, given in the column headed "Added tolerance for shift test at half capacity;" provided, however, that in this test the edge of the weight shall not be made to project over the edge of the commodity plate, pan or scoop.

*15. Spring scales whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 3 degrees or approximately 5 per cent with the horizontal, shall be equipped with a device which will indicate when the scale is level. The scale shall be rebalanced at zero each time its position is altered during this test.

*16. Spring balances of such construction that a weight or weights which are not visible can be added so as to affect the indications of the scale, shall be equipped with a device which will clearly indicate on the customer's side of the scale, when the weight or weights have been added, and the value which it or they represent on the scale.

17. Spring balances shall give correct weight indications whether the load on the plate, pan or scoop is being increased or decreased.

*Applies to Class 1 apparatus only.

18. The specifications for each part of combination spring and lever scales shall be the same as those for the type of scale to which such part belongs.

19. All spring scales shall be in level.

TOLERANCES.

Except on the special tests described above, the tolerances to be allowed in excess or deficiency on all spring scales equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects, shall not be greater than the values given in the tolerance table under the heading "Counter Balances and Scales."

Except on the special tests described above, the tolerances to be allowed in excess or deficiency on all spring scales not equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects, shall not be greater than the following values; provided, however, that the manufacturers' tolerances or the tolerances to be allowed on all new spring scales described herein, shall not be greater than one-half of the values given.

However, the tolerances on all spring scales described in the two preceding paragraphs, shall in no case be less than one-fourth of the minimum graduation on the reading face or dial, except that on new spring scales they shall in no case be less than one-eighth of such minimum graduation.

Graduation	Tolerance	Added tolerance for shift test at half capacity
1 pound	1/8 ounce	1/16 ounce
2 pounds	1/4 ounce	1/16 ounce
3 pounds	1/4 ounce	1/16 ounce
4 pounds	1/2 ounce	1/8 ounce
5 puonds	1/2 ounce	1/8 ounce
6 pounds	1/2 ounce	1/8 ounce
7 pounds	1/2 ounce	1/4 ounce
8 pounds	3/4 ounce	1/4 ounce
10 pounds	3/4 ounce	1/4 ounce
12 pounds	1 ounce	1/4 ounce
15 pounds	1 ounce	5/16 ounce
20 pounds	1 1/2 ounces	5/16 ounce
24 pounds	1 1/2 ounces	3/8 ounce
25 pounds	1 1/2 ounces	3/8 ounce
30 pounds	2 ounces	3/8 ounce
40 pounds	2 ounces	7/16 ounce
50 pounds	3 ounces	1/2 ounce
60 pounds	3 ounces	5/8 ounce
75 pounds	4 ounces	3/4 ounce
90 pounds	4 ounces	7/8 ounce
120 pounds	5 ounces	1 1/4 ounces
150 pounds	6 ounces	1 1/2 ounces
200 pounds	8 ounces	2 ounces
300 pounds	12 ounces	3 ounces
400 pounds	1 pound	
500 pounds	1 1/4 pounds	
600 pounds	1 1/2 pounds	

STRAIGHT-FACE SPRING BALANCES.

SPECIFICATIONS.

1. The support for the spring shall be of sufficient strength and rigidity to sustain the capacity load of the scale without perceptible strain, and such support shall be permanently fixed to the frame of the scale.

2. The graduated face shall be firmly riveted to the frame at not less than three points.

3. The indicator shall be pointed in order to facilitate accurate readings, and it shall not obscure the figures showing the value of the graduations.

*4. The value and spacing of the graduations shall satisfy the requirements of the following table:

Capacity	Maximum value of interval	Minimum distance between graduations
25 pounds	½ pound	.03 inch
50 pounds	1 pound	.03 inch
100 pounds	1 pound	.03 inch
200 pounds	2 pounds	.03 inch
300 pounds	5 pounds	.04 inch
400 pounds	5 pounds	.04 inch
500 pounds	5 pounds	.04 inch

TOLERANCES.

The tolerances to be allowed in excess or deficiency on all straight-face spring balances shall not be greater than four times the values given under the heading "Spring Balances—Tolerances."

COMPUTING SCALES.

SPECIFICATIONS.

1. Computing scales shall be correct in both their weight and value indications.

2. Computing scale charts shall not repeat the same values in any given column or row. This applies also to charts on which the value graduations are correctly placed, but which in addition have a duplication of value figures in any given column or row.

*3. The value graduations on all computing charts shall not exceed one cent on all prices per pound up to and including 30 cents. At any higher price per pound the value graduations shall not exceed two cents;

*Applies to Class 1 apparatus only.

provided, however, that nothing in the above shall be construed to prevent the placing of a special value graduation to represent each five cent interval. These special graduations may take the form of dots, staggered graduations or similar forms; they shall be so placed that their meaning and value may be clearly understood, but they shall not be placed in the space between the regular graduations.

*4. All computing scales equipped with a drum-shaped chart shall be so constructed that the opening on the dealer's side discloses at least two value graduations at the lowest price per pound. These scales shall be so constructed that the opening on the customer's side discloses the smallest graduations and a figure representing the proper number of main weight units when any load is placed on the pan or platform.

*5. All computing scales shall be equipped with weight indicators on both the dealer's and customer's sides and their width shall not exceed .015 inch. The distance between the chart and the weight indicators shall in no case exceed .06 inch. Both indicators shall reach to the graduated divisions and shall indicate clearly and correctly.

*6. All computing scales shall be equipped with a value indicator on the dealer's side and its width shall not exceed .015 inch. The distance between the chart and the value indicator shall in no case exceed .06 inch. This indicator shall reach to each value graduation and shall indicate clearly and correctly.

*7. The weight graduations and the value graduations shall be clear and distinct but in no case shall their width be less than .008 inch.

8. The maximum value of the weight graduations on computing scales used in the sale of foodstuffs at retail shall be 1 ounce.

9. The clear interval between the weight graduation marks on all computing scales shall not be less than .04 inch. The clear interval between the value graduation marks on all computing scales shall not be less than .02 inch; provided, however, that the latter requirement shall not be construed to apply to the special value graduation denoting the five-cent interval, mentioned heretofore.

*10. All devices for adjusting the balance of a computing scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the movable mechanism of the scale itself; such as a screw driver, wrench, etc., but not an adjusting pin.

*11. All devices for adjusting the level of a computing scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the leveling devices; such as a screw driver, wrench, etc., but not an adjusting pin.

*Applies to Class 1 apparatus only.

*12. Computing scales whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 3 degrees or approximately 5 per cent with the horizontal, shall be equipped with a device which will indicate when the scale is level, and in no case shall any pendulum operating the scale be considered a leveling device. The scale shall be rebalanced at zero each time its position is altered during this test.

13. Computing scales shall give correct results whether the load is being increased or decreased.

*14. All devices intended to increase the capacity of computing scales by the addition of an added weight or weights shall operate properly irrespective of the speed with which they are manipulated.

All computing scales shall be in level.

The specifications on a computing scale and on all parts of a computing scale, when not modified by the above, shall be the same as those of the type to which the scale under test belongs.

17. When the scale is of such a type that the definition of sensibility reciprocal is applicable, the maximum allowable sensibility reciprocal shall be the same value as is required of a non-computing scale of the appropriate type.

TOLERANCES.

Except on the special tests described above, the tolerances to be allowed in excess or deficiency on all spring computing scales equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects, and also all those not operated by springs, shall not be greater than the values given in the tolerance table under the heading "Counter Balances and Scales."

Except on the special tests described above, the tolerances to be allowed in excess or deficiency on all spring computing scales not equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects, shall not be greater than the values given in the tolerance table under the heading "Spring Balances."

However, the tolerances on all computing scales equipped with a reading face or dial, shall in no case be less than one-fourth of the minimum graduation on the reading face or dial, except that on new computing scales they shall in no case be less than one-eighth of such minimum graduation.

*Applies to Class 1 apparatus only.

CREAM TEST AND BUTTER-FAT SCALES.

SPECIFICATIONS.

*1. All scales shall be provided with a graduated scale or arc divided into at least ten equal spaces, over which the indicator shall play.

*2. The clear interval between the graduations on the graduated scale or arc shall not be less than .05 inch.

3. The indicator shall be of such length as to reach to the graduated divisions and shall terminate in a fine point to enable the readings to be made with precision.

*4. All scales whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 3 degrees or approximately 5 per cent with the horizontal, shall be equipped with leveling screws and with a device which will indicate when the scale is level. The scale shall be rebalanced at zero each time its position is altered during this test.

5. All scales shall be so constructed and adjusted that when the pans are released or disturbed the pointer will return to its original position of equilibrium.

SENSIBILITY RECIPROCAL.

The sensibility reciprocal of these scales shall be one-half grain (30 mg. approximately).

The term "sensibility reciprocal" means the weight required to move the position of equilibrium of the beam, pan, pointer or other indicating device of the scale a definite amount. In scales provided with a pointer, and a graduated scale or arc, such as the above, the sensibility reciprocal is the weight required to cause a change in the position of rest of the pointer equal to one division on the graduated scale or arc.

TOLERANCES.

The tolerance to be allowed in excess or deficiency on all cream test and butter-fat test scales, shall not be greater than one-half grain (30 mg. approximately), when the scale is loaded to capacity.

WEIGHTS.

SPECIFICATIONS.

1. Weights shall be made of steel, iron, brass or any other metal or alloy of metals not softer than brass; provided, however, that weights below $\frac{1}{4}$ ounce shall not be made of iron or steel, but may be made of aluminum.

*Applies to Class 1 apparatus only.

2. Weights shall have smooth surfaces and no sharp points or corners.

3. Weights shall not be covered with a soft or thick coat of paint or varnish.

4. All holes in which foreign material is to be placed for adjusting purposes must be of such form that this material will be permanently and securely held in place. In no case shall this adjusting material project beyond the surface of the weight.

5. Rings on weights shall not be split or removable.

*6. All weights shall be clearly marked with their nominal value and in addition weights intended for use on multiplying-lever scales shall be clearly marked with the value they represent when used upon the scale for which they are intended.

TOLERANCES.

The tolerances to be allowed in excess or deficiency on commercial weights shall not be greater than the following values; provided, however, that the manufacturers' tolerances or the tolerances to be allowed on new commercial weights shall not be greater than one-half of the values given:

Weight	Tolerance			
	Ordinary weights ratio 1 to 1 pound	Counterpoise weights for multiplying-lever scales		
		Ratio less than 100 to 1 pound	Ratio 100 to 1 and less than 1,000 to 1 pound	Ratio 1000 to 1 pound and over
50 pounds	100.0 grains	60.0 grains	40.0 grains	20.0 grains
25 pounds	60.0 grains	36.0 grains	24.0 grains	12.0 grains
20 pounds	60.0 grains	36.0 grains	24.0 grains	12.0 grains
15 pounds	40.0 grains	24.0 grains	16.0 grains	8.0 grains
10 pounds	40.0 grains	24.0 grains	16.0 grains	8.0 grains
8 pounds	30.0 grains	18.0 grains	12.0 grains	6.0 grains
5 pounds	30.0 grains	18.0 grains	12.0 grains	6.0 grains
4 pounds	20.0 grains	12.0 grains	8.0 grains	4.0 grains
3 pounds	20.0 grains	12.0 grains	8.0 grains	4.0 grains
2 pounds	15.0 grains	9.0 grains	6.0 grains	3.0 grains
1 pound	10.0 grains	6.0 grains	4.0 grains	2.0 grains
10 ounces	10.0 grains	6.0 grains	4.0 grains	2.0 grains
8 ounces	5.0 grains	3.0 grains	2.0 grains	1.0 grains
5 ounces	5.0 grains	3.0 grains	2.0 grains	1.0 grains
4 ounces	5.0 grains	3.0 grains	2.0 grains	1.0 grain
2 ounces	3.0 grains	1.8 grains	1.2 grains	.6 grain
1 ounce	2.0 grains	1.2 grains	.8 grains	.4 grain
1/2 ounce	2.0 grains	1.2 grains	.8 grain	.4 grain
1/4 ounce	1.0 grains	.6 grain	.4 grain	.2 grain
1/8 ounce	.5 grain	.3 grain	.2 grain	.1 grain
1/16 ounce	.5 grain	.3 grain	.2 grain	.1 grain
1/32 ounce	.5 grain	.3 grain	.2 grain	.1 grain
1/64 ounce	.2 grain	.12 grain	.08 grain	.04 grain

*Applies to Class 1 apparatus only.

The tolerances to be allowed in excess or deficiency on apothecaries' prescription weights shall not be greater than the following values; provided, however, that the manufacturers' tolerances or the tolerances to be allowed on new apothecaries' prescription weights shall not be greater than one-half of the values given:

Apothecaries' System.

Weight (ounces Troy)	Tolerance	Weight	Tolerance
12 ounces	4.0 grains	3 drachms	.6 grain
10 ounces	4.0 grains	2 drachms	.5 grain
8 ounces	3.0 grains	1 drachm	.3 grain
5 ounces	3.0 grains	3 scruples	.3 grain
4 ounces	2.0 grains	2 scruples	.3 grain
3 ounces	2.0 grains	1 scruple	.15 grain
2 ounces	2.0 grains	20 grains	.15 grain
1 ounce	1.0 grain	15 grains	.15 grain
8 drachms	1.0 grain	10 grains	.10 grain
6 drachms	1.0 grain	5 grains	.08 grain
4 drachms	.7 grain	1 grain	.03 grain

Metric System.

Weight	Tolerance	Weight	Tolerance
500 grams	350.0 milligrams	2 grams	15.0 milligrams
200 grams	200.0 milligrams	1 gram	10.0 milligrams
100 grams	150.0 milligrams	500 milligrams	6.0 milligrams
50 grams	100.0 milligrams	200 milligrams	6.0 milligrams
20 grams	50.0 milligrams	100 milligrams	2.5 milligrams
10 grams	40.0 milligrams	50 milligrams	2.0 milligrams
5 grams	20.0 milligrams		

Metric System.

No specification contained in the preceding pages shall be understood or construed to prohibit the sale or use of weights and measures or weighing or measuring devices constructed or graduated in units of the metric system.

The tolerances to be allowed on any weight or measure or weighing or measuring device constructed or graduated in units of the metric system, shall be the same as those specified on similar apparatus of an equivalent size or at an equivalent load, in the customary system.

OPINION REGULATING THE SALE OF WOOD AND ESTABLISHING THE CORD MEASURE.

Section 6 of Chapter 668, California Statutes, approved June 8, 1915, provides as follows:

> "The state superintendent of weights and measures may establish tolerances for use in the State of California similar to the tolerances established by the national bureau of standards, and he may establish a standard net weight, or net measure, or net count, of any commodity, produce, or article."

While the law gives to the superintendent the power to establish and standardize the "net weight" and "net measure" of common commodities in general, the intent of the law is to fix and adopt and enforce a uniform standard of weight and measure of such commodities, the weight or measure for which, under the present custom of sale, facilitates the perpetration of fraud, or where the present custom of sale prejudices and discriminates against the just and equitable interests of the public.

Wood, for fuel purposes, is a common necessity, and it shall only be sold or offered for sale by cord measure, excepting as hereinafter provided.

The *cord* is hereby established as a standard measure. Its dimensions shall be *eight feet long* and *four feet wide* and *four feet high,* and shall contain 128 cubic feet, well stowed and packed.

In all sales of wood for fuel, the cord of 128 cubic feet shall be the true and legal standard of measure. Any usage, by-law, or ordinance, or custom of any person, firm, or corporation to the contrary notwithstanding.

The legal subdivisions of the cord shall be one-fourth, one-half and three-fourths, and these subdivisions shall be equivalent to the same subdivisions of the cubic feet established to contain in the cord, to wit:

¼ cord shall contain 32 cubic feet.
½ cord shall contain 64 cubic feet.
¾ cord shall contain 96 cubic feet.

In the sale of stove wood of any length, the term "tier" or "rick" shall not be used to indicate a standard measure. The term "tier" is hereby defined as wood piled in layers, or piled uniform, so as to conveniently determine volume. A "rick" has no meaning in the sale of wood. One "tier" of wood, *eight feet long* and *four feet high* and *twelve inches wide,* equivalent to 32 cubic feet, shall be designated and sold as *one-fourth cord.* One "tier" of wood, *eight feet long* and *four feet high* and *twenty-four inches wide,* equivalent to 64 cubic feet, shall be designated and sold as *one-half cord.*

The lengths into which the wood may be sawed, and offered for sale, shall not in any way affect the cubic volume of the standard cord.

In the sale of wood for fuel, each load, part of load, or parcel of wood shall be accompanied by a voucher or tag, certifying to the number of cords or part of cord of wood in each load, and such voucher or tag shall state the true measure of wood delivered.

No provision or part of this opinion shall be construed to prevent the sale of box-wood or kindling, or cut lumber by the load.

Yours very truly,

CHAS. G. JOHNSON,
State Superintendent of Weights and Measures.

Tests made and sworn to, showing number of cubic feet remaining out of a (4 x 4 x 8=128 cubic feet) cord, after sawing in lengths as follows:

	9½ inches	Per cent	12 inches	Per cent	16 inches	Per cent	24 inches	Per cent
Test No. 1	102	20	96	25	107	16⅔	112	12½
Test No. 3			90 to 120	16⅔				
Test No. 4			96	25	91	30	116⅔	9
Test No. 5			96	25	105	18	112	12½
Test No. 6			105	18	109	20	112	12½
Test No. 7			99½	22				
Test No. 8			80 to 96	25				
Test No. 9	90⅔	30					109	20
Test No. 10			96	25				
Test No. 11	84	35	98	25			116	9

CHAS. G. JOHNSON,
State Superintendent of Weights and Measures.

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STATE DEPARTMENT
OF
WEIGHTS AND MEASURES
CHAS. G. JOHNSON,
SUPERINTENDENT
SACRAMENTO, CALIFORNIA